CLAIMS

1. In a laser device of the type having a laser head and a robot, the laser head being mounted to the robot, the laser head having a housing, a focal lens disposed within the housing, and a light source in optical communication with the focal lens, wherein the improvement comprises:

(a) means for determining the operating mode of the laser device;

(b) means for determining the distance the laser head is operating at above a surface of a workpiece; and

(c) means for stopping the operation of the laser device to avoid damage to the laser device when the laser head is detected at a predetermined distance above a surface of a workpiece.

2. The laser device of Claim 1 wherein the means for stopping is adapted to stop the laser device when the laser head is positioned between 0 mm to about 1mm above a surface of a workpiece.

3. The laser device of Claim 2 wherein the operating mode of the laser device is selected from the group consisting of parked, teach, run, hold, extended limit, or retracted limit.

4. The laser device of Claim 3 wherein the means for stopping is adapted to stop the laser device when the laser head is positioned between 3 mm to about 6 mm above the surface of the workpiece when the operating mode of the laser device is the parked mode.

5. The laser device of Claim 2 wherein the means for determining the distance the laser head is operating above a surface of a workpiece further comprises means for capacitive sensing.

6. In a laser device of the type having a laser head and a robot, the laser head being mounted to the robot, the laser head having a housing, a focal lens disposed within the housing, and a light source in optical communication with the focal lens, wherein the improvement comprises:

(a) the housing being a telescopable housing having a first body portion and a second body portion, the first body portion being telescopable with the second body portion;

(b) means for determining the operating mode of the laser device;

(c) means for detecting the distance the laser head is operating at above a surface of a workpiece; and

(d) means for stopping the operation of the laser device to avoid damage to the laser device when the laser head is detected at a predetermined distance above a surface of a workpiece.

7. The laser device of claim 6 wherein the laser device further comprises:

means for determining if the telescopable housing is at an extended limit;

means for stopping the operation of the laser device if the telescopable housing is at an extended limit;

means for determining if the telescopable housing is at a retracted limit; and

means for stopping the operation of the laser device if the telescopable housing is at a retracted limit.

8. The laser device of Claim 7 wherein the means for stopping is adapted to stop the laser device when the laser head is positioned between 0 mm to about 1mm above a surface of a workpiece.

9. The laser device of Claim 8 wherein the operating mode of the laser head is selected from the group consisting of parked, teach, run, or hold.

10. The laser device of Claim 7 wherein the means for determining the distance the laser head is operating above a surface of a workpiece further comprises means for capacitive sensing.

11. In a laser device of the type having a laser head and a robot, the laser head being mounted to the robot, the laser head having a housing, a focal lens disposed within the housing, and a light source in optical communication with the focal lens, wherein the improvement comprises:

(a) means for determining the operating mode of the laser device;

(b) means for determining the distance the laser head is operating above a surface of a workpiece;

(c) means for prohibiting the operation of the laser device to avoid damage to the laser device when the laser head is detected at a predetermined distance above a surface of a workpiece;

(d) the housing being a telescopable housing;

(e) means for stopping the operation of the laser device if the telescopable housing is at an extended or retracted limit; and

wherein the means for stopping the operation of the laser device comprises a crash interlock.

12. The laser head of Claim 11 wherein the predetermined distance is from about 0 mm to about 1mm above the surface of the workpiece.

13. The laser head of Claim 11 wherein the operating mode of the laser device is selected from the operating group consisting of parked, teach, run, or hold.

14. The laser device of Claim 11 wherein the means for determining the distance the laser head is operating above a surface of a workpiece comprises means for capacitive sensing.

15. The laser device of Claim 11 wherein the means for determining the operating mode comprises a PLC.

16. The laser device of Claim 11 wherein the means for determining the operating mode comprises a computer having a computer program.

17. The laser device of Claim 11 wherein the means for determining the operating mode of the laser head, and the means for determining the distance, and the means for prohibiting the operation of the laser head, and the means for stopping the operation of the laser device comprises an electronic circuit.

18. In a laser head of the type adapted to be mounted to a robot, the laser head having a housing, the housing having a nozzle with a tip, a focal lens in the housing and a light source in optical communication with the focal lens, the focal lens adapted to focus a light beam from the light source into a focused laser beam having a focal point, wherein the improvement comprises:

means for adjusting the light path of a light beam from the light source within the housing onto a focal optic wherein the means for adjusting is adapted to center the focused laser beam coaxial with the tip.

19. A laser head, the laser head being mountable to a robotic unit, the laser head having a housing, a focal lens in the housing and a light source in optical communication with the focal lens, the housing having a nozzle with a tip wherein the improvement comprises:

a device for adjusting a light path of a light beam directed from the light source onto a focal optic to center a focused laser beam formed by the focal optic coaxial with the tip, wherein the device is translatably supported by the housing.

20. The laser head of Claim 19 wherein the device for adjusting the light path within the housing comprises a receiving optic for receiving the light beam, the receiving optic being translatably supported within the housing to adjust the light path of the light beam along a first axis of the housing to center the focused laser beam coaxial with the tip.

21. The laser head of Claim 20 wherein the receiving optic is pivotally supported within the housing to adjust the light path of the light beam along a second axis of the housing.

22. The laser head of Claim 19 wherein the receiving optic is translatable along a first axis and pivotal along a second axis to adjust the light path of the light beam onto the focal lens to center the focused laser beam coaxial with the tip.

23. The laser head of Claim 19 wherein the light source comprises an optical fiber, and the device for adjusting the light source comprises a fiber adapter, the fiber adapter adapted to support the optical fiber and direct a beam of light from the optical fiber into the housing, the fiber adapter being translatable about the housing to adjust a path of the light beam onto a receiving optic supported within the housing to center the focused laser beam coaxial with the tip.

24. The laser head of Claim 20 wherein the light source is an optical fiber supported by a fiber adapter, the optical fiber being adapted to direct a light beam into the housing to the receiving optic, the optical fiber being separated from the receiving optic by a distance, the fiber adapter being translatable with the receiving optic to maintain a constant distance between the optical fiber and the receiving optic.

25. A laser head, the laser head being mountable to a robotic unit, the laser head having a housing, a focal lens in the housing and a light source in optical communication with the focal lens wherein the improvement comprises:

the housing being a telescopable housing; and

a telescopable assist gas delivery tube, wherein the assist gas delivery tube is disposed within the telescopable housing.

26. The laser head of Claim 25 wherein the laser head further comprises a nozzle attached to the housing, the nozzle having a first tapering portion, a second elongated tapering portion and a third tapering portion.

27. In a laser head of the type being adapted to mount to a robotic, the laser head having a housing, a focal lens in the housing and a light source in optical communication with the focal lens, wherein the improvement comprises:

means for adjusting a light path within the housing of a light beam from the light source, wherein the housing is a telescopable housing.

28. The laser head of Claim 27 further comprising an assist gas delivery tube disposed within the telescopable housing, wherein the assist gas delivery tube is telescopable.

29. The laser head of Claim 28 further comprising an elongated nozzle attached to the housing.

30. The laser head of Claim 28 wherein the means for adjusting further comprises a receiving optic, the receiving optic being translatably supported within the housing to adjust a light path of a light beam along a first axis of the housing and pivotally supported to adjust the light path of the light beam along a second axis of the housing onto the focal lens.

Add A2)